The
WEIR FURNACE

Catalog № 20

The Meyer Furnace Co.
Peoria Ill.

WEIR

The Weir
All-Steel Gas and Soot-Consuming
FURNACE

Catalog No. 20

MANUFACTURED BY

The MEYER FURNACE Co.

Peoria-Illinois

Weir
THE WEIR FURNACE
PEORIA, ILL.
THE MEYER FURNACE CO.
PATENTED

Foreword

OVER a third of a century of manufacturing—pioneers in the making of warm air furnaces from steel—the only manufacturers to successfully perfect the principles of burning gas and soot in warm air furnaces; and the only manufacturers to make them absolutely, and *permanently,* gas and dust tight.

Pithily put, that is the good story of THE MEYER FURNACE COMPANY. The WEIR All-Steel Gas and Soot Consuming Furnace has now behind it a history of more than a third of a century of uninterrupted and unparalleled success, fully demonstrating the correctness of the principles on which it was designed.

The WEIR is the Father of Steel Furnaces.

Evidence of WEIR superiority lies in the fact that it has been widely imitated, but the imitations lack, and *always will lack,* the vital and valuable qualities peculiar to the WEIR. Its superiority cannot be *successfully* imitated.

The buyer of a WEIR gets the benefit of many years of experience, and the best furnace that can be produced.

We invite inquiries with assurance that all communications will receive most courteous and prompt attention.

THE MEYER FURNACE CO.

Satisfaction

THERE is wonderful satisfaction for a dealer in selling a furnace the use of which for years afterward, proves his promise to customers well founded and true. When an article is found wanting in promised merit, the customer bears it against the dealer afterward, more than against the manufacturer, who really is responsible but is not always accessible.

The WEIR furnace has withstood the test of time, and has not been found wanting. It insures satisfaction for the dealer who sold it, as well as for the user who enjoys it.

The illustrations of the WEIR Steel Furnace shown herein, are well worthy of careful study. Examine the various sectional illustrations until you are thoroly familiar with the superior points which overcome the oldtime objections aroused by other furnaces, ill-conceived or defective in construction.

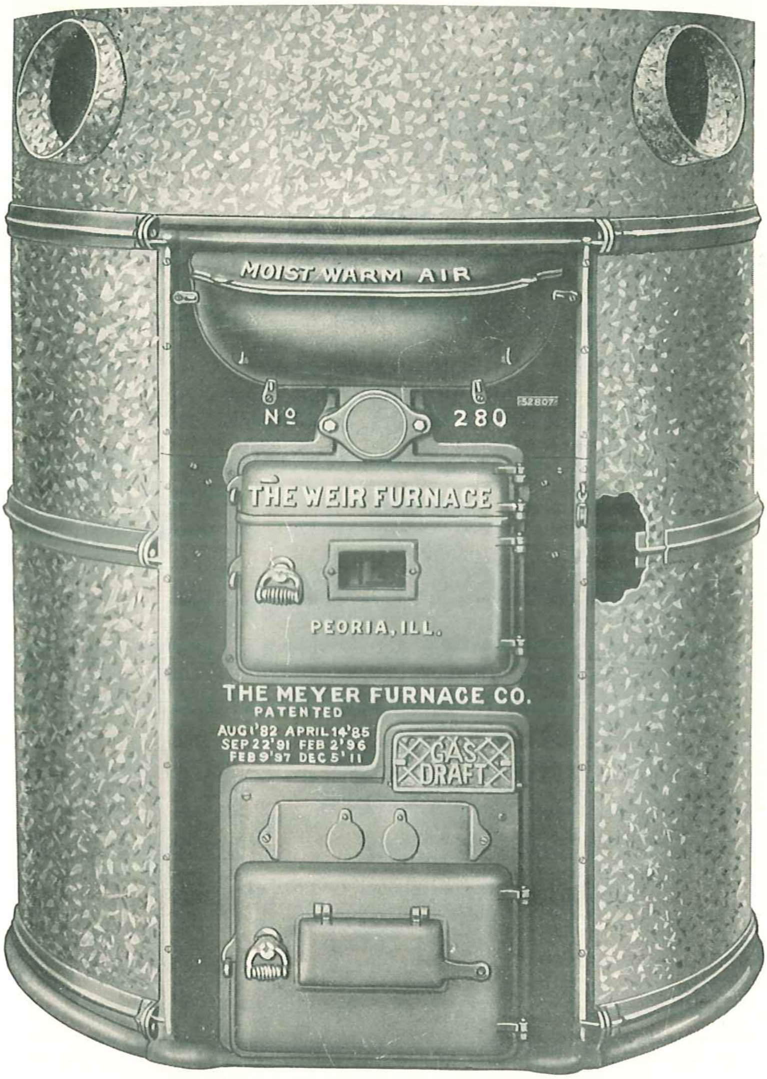
Do not be satisfied until you have learned of all the details which this book can teach you, or until you understand the good points as *clearly* as we intend you should.

It is our ambition to teach the principles embodied in this famous furnace to all the heating trade because we are proud of our accomplishment.

Our Gas and Soot Consuming feature is covered by Letters Patent. Even the basic principle was valuable, but now in its perfected state it will accomplish results far beyond what was once thot impossible.

Each piece of material used in the WEIR is of the best of its kind, assembled by the latest improved machinery, in charge of expert mechanics. Each furnace is assembled separately, insuring perfect fitting parts thruout.

The WEIR is the ideal furnace from every standpoint. It is fully guaranteed.

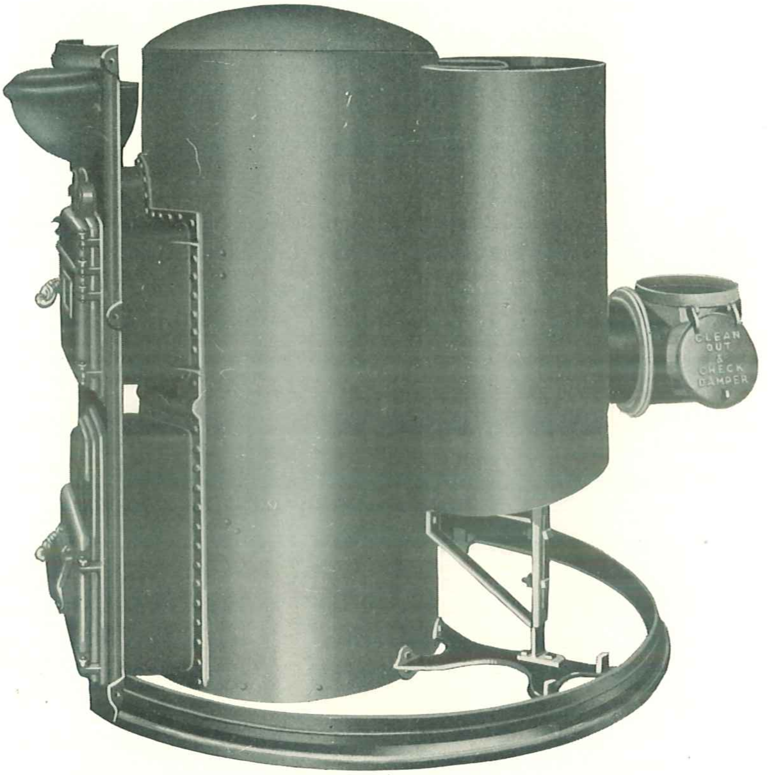


The Weir Portable Furnace

With Casing. Made in Six Sizes

It can be cased up quicker than any other furnace, as the front is complete to top ring; therefore it requires no cutting or piecing of iron. WEIR casings are made of heavy galvanized iron, lined with corrugated iron, to prevent heat loss into basement.

Note that two casing rings are used at each casing joint, so constructed that erection is easy as each section of casing is drawn tightly between rings. This makes the tightest casing joint obtainable. No leakage of coal dust dirt and gases from the basement into the heat chamber on the WEIR furnace is possible because of the double leak-proof casing rings—a *distinctive* WEIR feature, not found in other furnaces.



The Weir Portable Furnace

Side View without Casing

Showing its massive boiler-like construction and immense heating surface. The body or Main Drum is 3/16-inch (the larger sizes are ¼-inch) and the head ¼-inch thick; all of low carbon boiler plate, ordered and rolled especially for use in making WEIR furnaces, each and every piece guaranteed to conform to our rigid specifications.

The Difference

THE durability of a furnace depends entirely upon the material used in its construction. If a furnace is made of poor materials, it will soon burn out, and if not made on scientific principles, it will be found defective in vital points.

Among the *weakest points* in a furnace are the *joints.*

Cast iron furnaces depend entirely upon cement for packing their joints, and this cement is practically useless after a furnace has been in use a while; the contraction and expansion will crack the cement, opening the joints, allowing smoke and soot to escape into the air chamber from whence it finds its way into the living rooms.

The WEIR furnace has no joints.

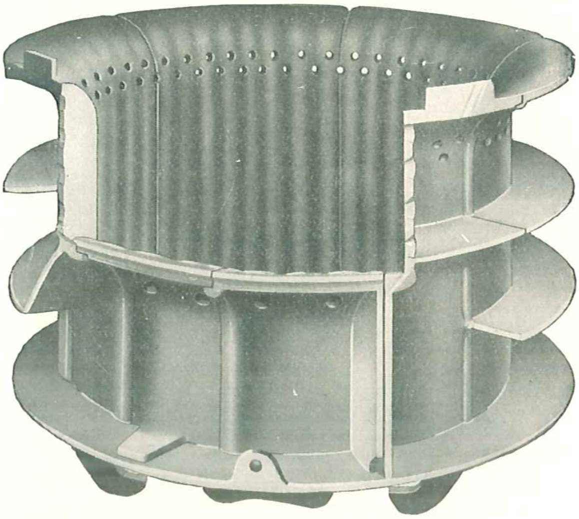
Let us repeat that statement—the WEIR furnace *has no joints.* It is made practically into one piece of mild, *low carbon boiler plate,* which is absolutely impervious to gases at all temperatures.

What importance has the use of this metal particularly? Just this—and it's very interesting—this metal is uniform in texture and composition, anti-corrosive, ductile and possessed of a tensile strength of 60,000 pounds to the square inch. Having a uniform expansive quality thruout it has neither fiber to *tear,* nor sand to drop, as is the case in all cast metals. Heated, it "gives and takes" and will not crack.

THIS cut illustrates The Famous WEIR Gas and Soot Consuming Firepot which is so well and favorably known from coast to coast.

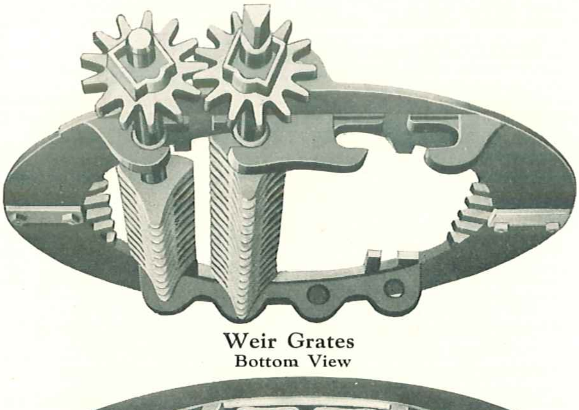
Aside from its ability to extract heat from all the gases which ordinarily pass up the chimney unconsumed, it can be easily installed and replaced thru the feed door without tearing down or disturbing any other part of the furnace installation.

The Famous Weir Firepot

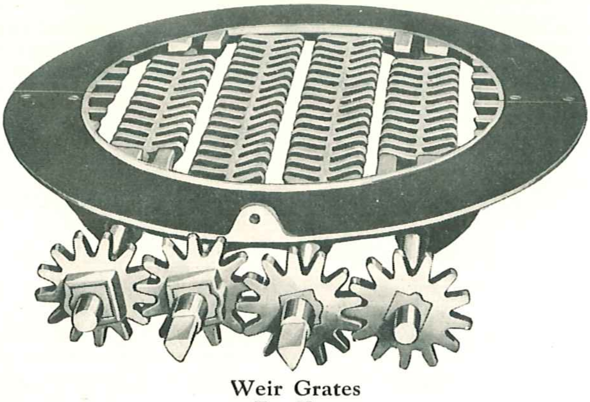


The Weir Grates

The WEIR Grates are the simplest and most perfect working on the market. They operate in such a manner as to free themselves of clinkers and clear the fire from ashes without loss of fuel. They are constructed with special stress laid on durability to withstand heavy wear and tear. In case of breakage, grates can be easily replaced in a few moments. The center and side bars become interchangeable by merely reversing cog wheels.



Weir Grates
Bottom View



Weir Grates
Top View

The Weir Fire Pot

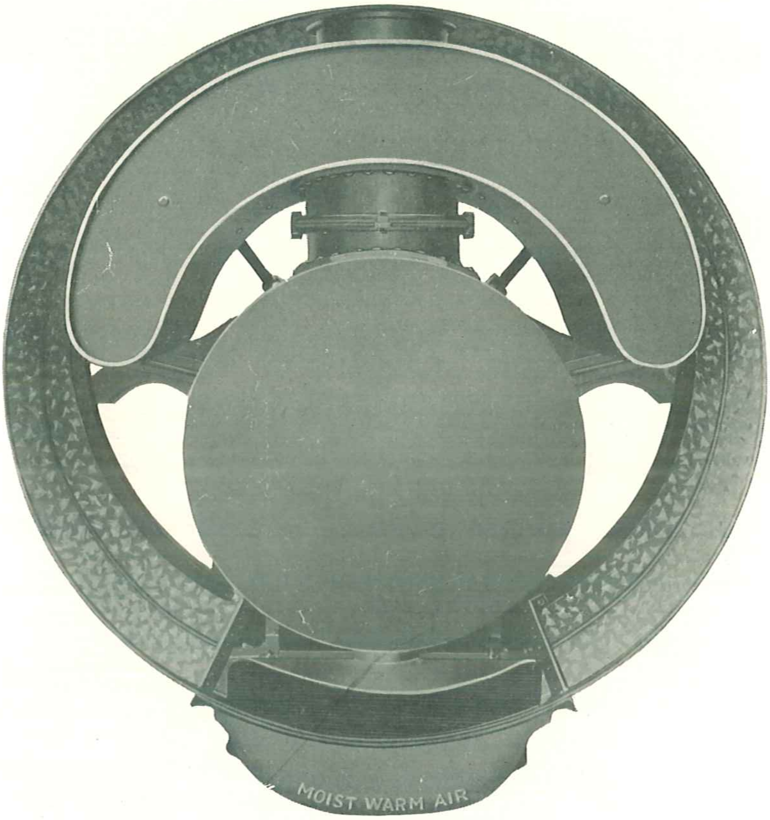
THE patented principle of this exceptional firepot is really very simple.

Authorities on the subject say that in burning ordinary soft coal, about 50 per cent of the value of this coal usually passes up the chimney in rich burnable gases. Years ago it was discovered that pre-heated air introduced into these highly combustible gases would ignite them and produce an intensely hot flame. You will note by the illustration on page 14 that this air is admitted at the front of the furnace firepot and is caused to travel in the channels between the pot and the gas tight shell of the furnace several times. Thus being heated, it is then thrown over the fire, directly into these volatile gases, igniting and burning them, resulting in an intensely hot flame.

After the gases are burned, no soot forms.

Every feed door on a WEIR is equipped with a mica window so any one can see the brilliant jets of flame, which come from the holes around the top of the firepot, when the furnace is in operation.

All other details of correct and best construction of a fire pot have been carefully considered and adapted—such as perpendicular lines on the inside of the pot which prevent packing of fuel, etc. Because the intensely hot flame produced by the gas burning arrangement is located near the outside of the firepot, naturally more fuel consumption takes place around the edge of the furnace drum than in the center of the firepot. This is exactly the proper place for the hottest part of the fire, near a point which will heat the air chamber.

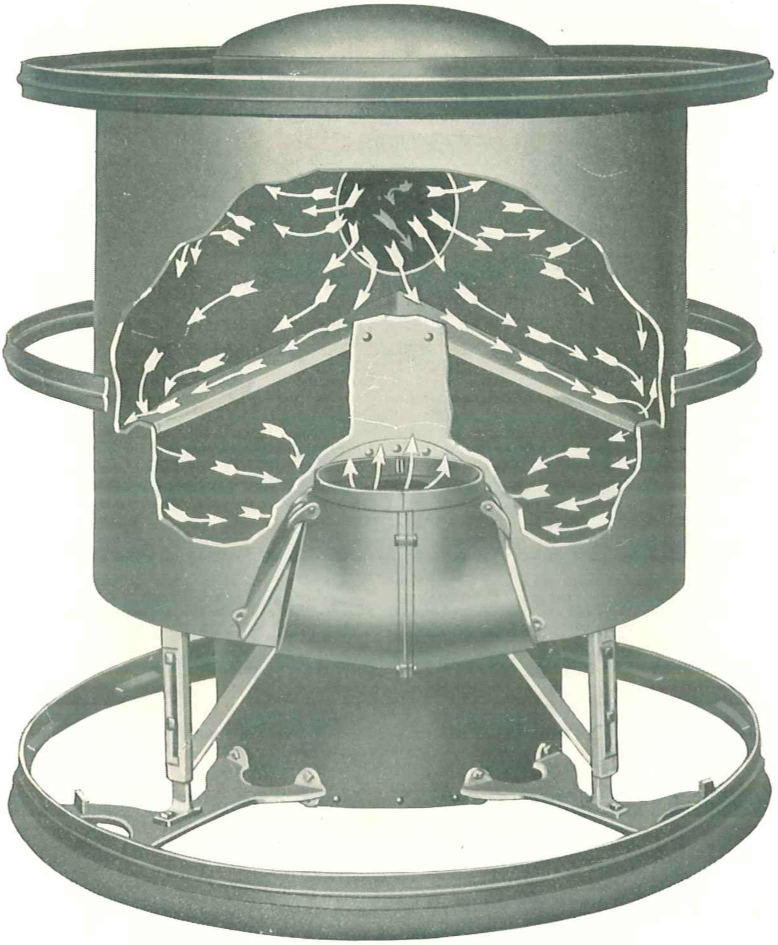


The Weir Portable Furnace

Top View

Illustration showing top view with hood of casing removed. We invite particular attention to the large, free air area, which permits of supplying a large volume of pure, warm air, as compared to the small area of ordinary furnaces in which the air must necessarily be overheated.

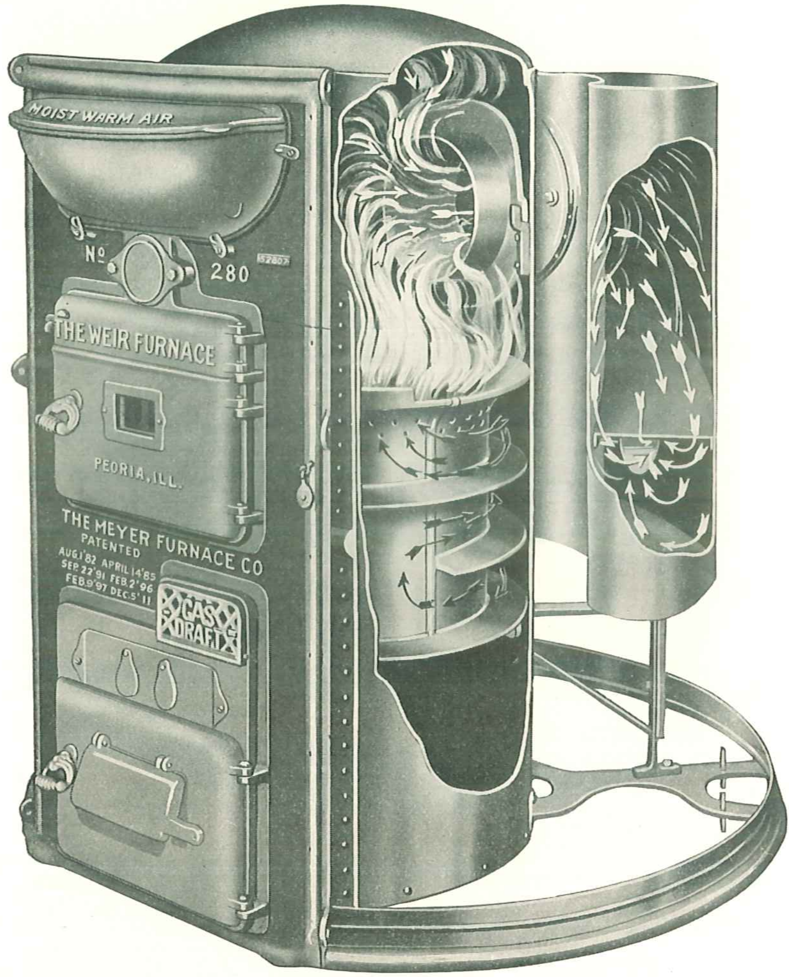
Also note the large dimensions of Radiator or extra heat drum, in which the heating surface alone is equal to the entire heating surface in some furnaces. Also note the location of the water pan.



Rear View of WEIR without Casing

(showing extra heat drum, or radiator, in section)

This view clearly illustrates the principle of the WEIR Extra Heat Drum or Radiator—how the products of combustion, after leaving the combustion chamber, travel thru this auxiliary drum on their way to the chimney. In passing thru this auxiliary drum, the heat units are radiated into the air chamber and into the living rooms, resulting in an actual saving in fuel.



The Weir *Steel* Furnace

Sectional View Showing Features of Construction

Distinctive WEIR Features

THE water pan is so located that a large surface is exposed to heat, assuring the evaporation of a large amount of water, and supplying an abundance of healthful, moist warm air. Provision is made for attaching an automatic filler. The entire pan may be easily removed.

The large double feed door—14″ x 17″ in size—permits the use of large lumps of coal, and makes the fire pot easily accessible.

All doors are ground to fit tight, assuring perfect control of fire. Drop caps over shaker ports close automatically when shaker is removed.

Exceptionally large casings on the WEIR assure unhindered circulation of air, and comfortably heated rooms. Another WEIR feature—the double casing rings—is explained on page 7.

The front connects to the furnace proper by means of an ingenious arrangement so constructed that leakage of gases to or from the basement or into the heat chamber is impossible.

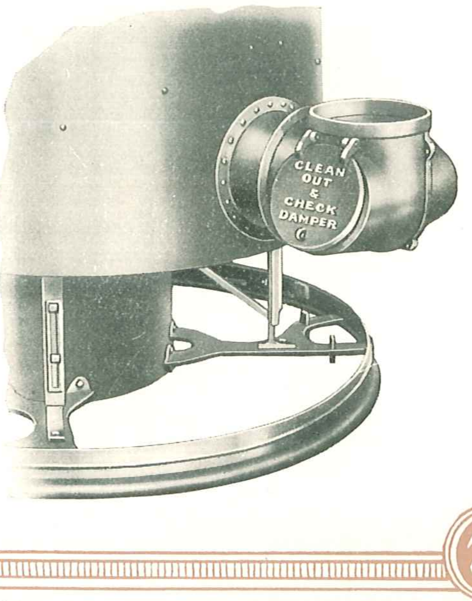
The WEIR Gas and Soot Consuming Firepot, that actually results in a saving of fuel. Explained in detail on pages 10 and 11.

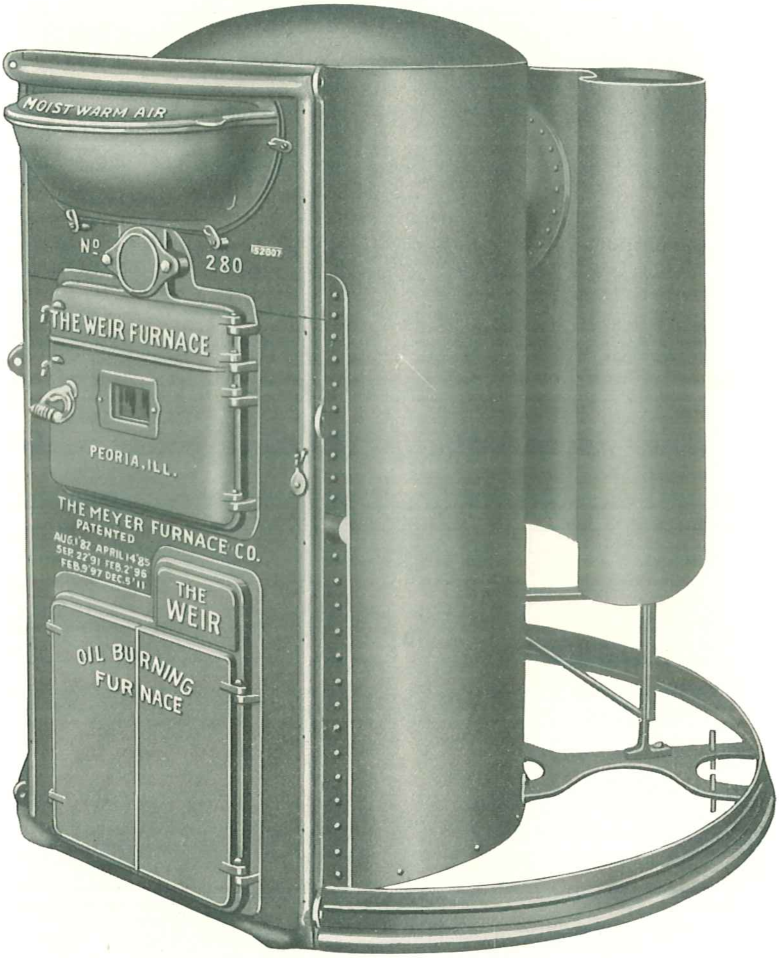
The WEIR auxiliary heat drum, or radiator, is another WEIR fuel-saving feature. The long fire travel and added radiating surface, as shown on page 13 assure more heat in living rooms and permit less to escape out the chimney.

The radiator supports have sliding joints, making it possible to quickly give the radiator a solid support.

Electrically Welded seams in both main drum and radiator remove the remotest possibility of gas or smoke leakage into living rooms.

The Combination Smoke Outlet, Check Damper and Cleanout is made with an absolutely tight joint. This device is appreciated by every WEIR owner. Either side, or both, can be used—depending upon the position of the furnace.





The Weir (*Steel*) Oil Burning Furnace

Doors Made to Order to Accommodate any Make or
Type of Oil Burner

The Weir Steel Furnace

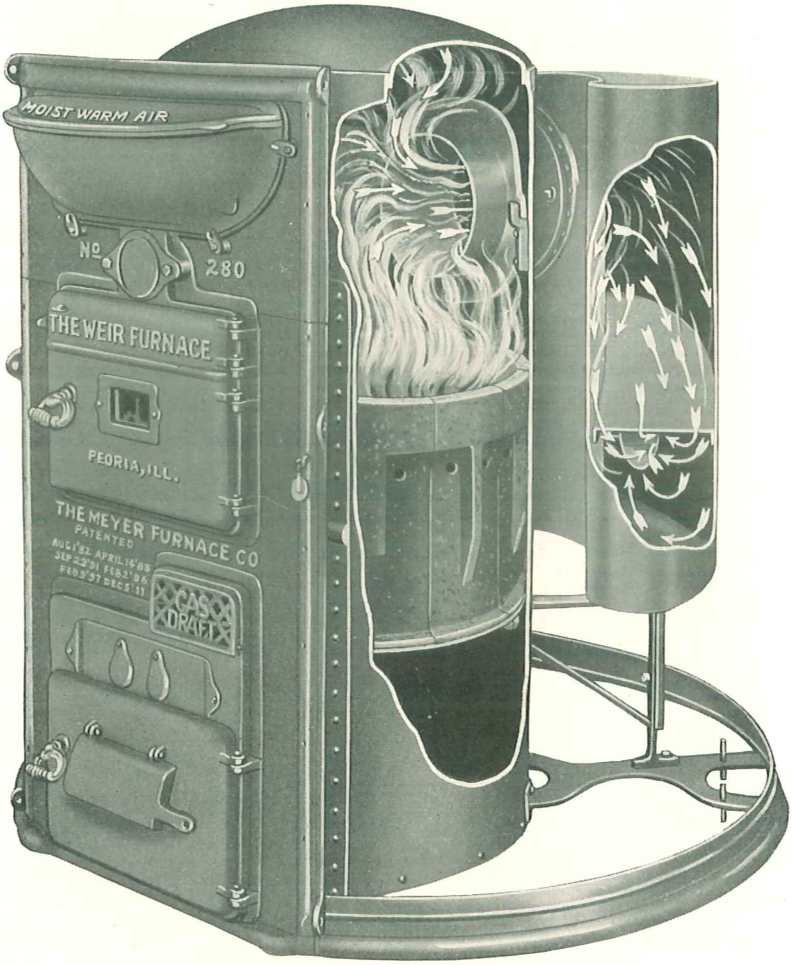
For Oil Burning

WITH the ever increasing popularity of oil burning, there is a growing demand for a proven satisfactory oil-burning furnace—particularly for the mechanical or fan blast type of Oil Burners.

The WEIR Furnace supplies this demand, because it is the one warm air furnace having every requisite for oil burning:

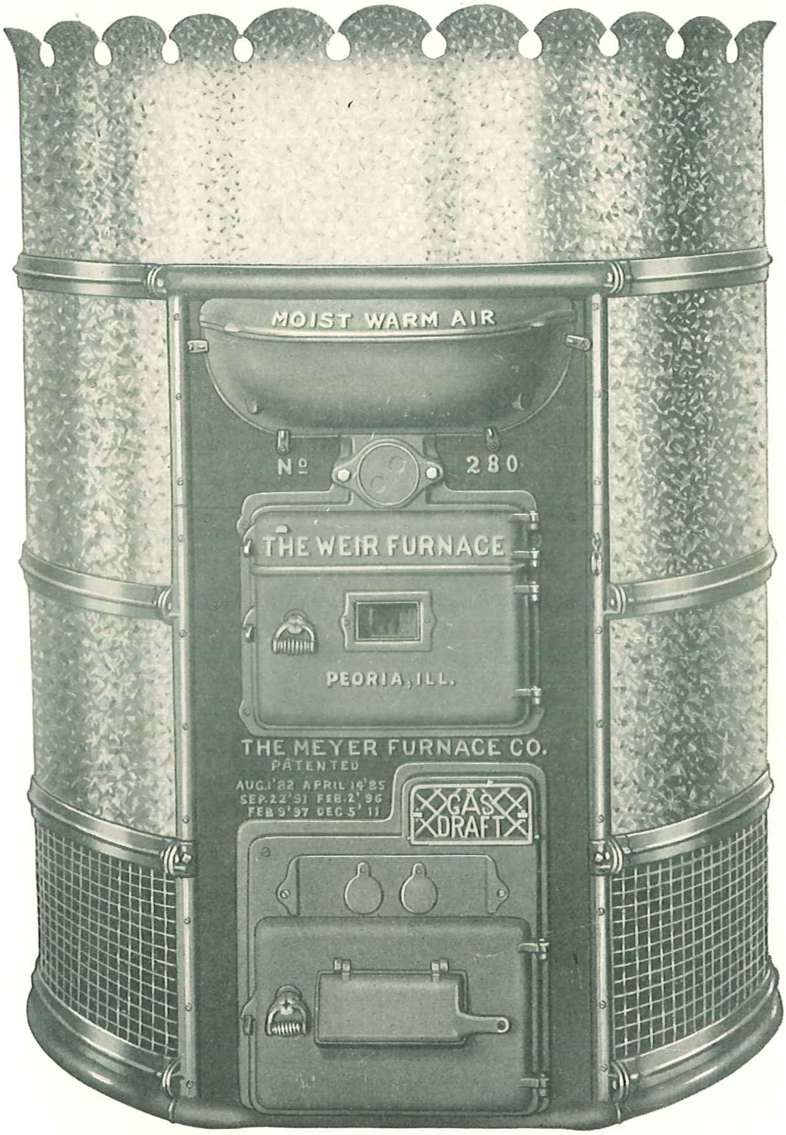
> WEIR Steel Construction—electric welded and riveted thruout, absolutely and permanently tight and leakproof, assures permanent cleanliness, and guarantees against leakage of smoke, oil or odors.
>
> *There are no dampers or other openings inside the casing of the WEIR Furnace.*
>
> The WEIR Furnace, being of steel construction heats more quickly, and its long indirect fire travel and immense heating surfaces, assure a maximum delivery of heat into the living rooms, permitting the least possible to escape out the chimney; yet there are no complicated flues nor small smoke passageways to clog and impair efficiency, requiring cleaning or other attention frequently.

The WEIR Steel furnace is the one
proven satisfactory Oil-Burning Furnace.



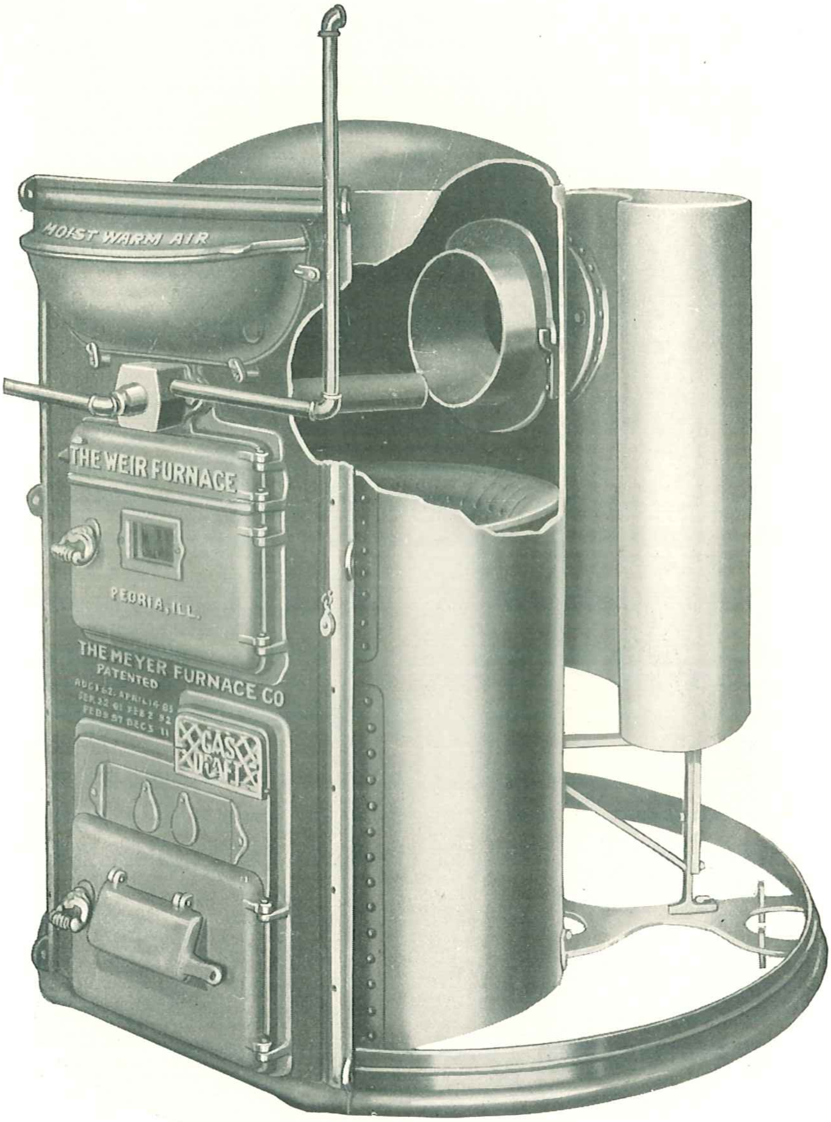
The Weir *Steel* Furnace

With Tile (Fire-Brick) Fire Pot Lining
(Especially recommended for hard coal and coke)



The Weir Circulating Room Heater

In our Room Heaters, we retain the same well-known features of cleanliness, fuel-saving and heat-giving as are embodied in the WEIR Furnace; they are used for heating schoolrooms, churches, stores, shops and any large rooms where furnace cannot be set in basement. It heats by circulation, the cold air being drawn through openings at bottom of casing and thrown out, heated, through the top, producing an even temperature throughout the room, equal to a heater set in the basement. Should be set on a brick or cement base.



The Weir Furnace

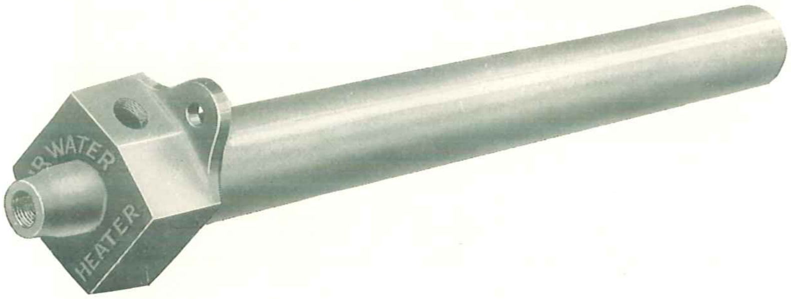
With Water Heater Attached

All WEIRS are provided with an opening so that a Water Heater can be attached without cutting. All that is necessary is to take off cap over the opening in front and install the heater, which can be done at any time. It is the simplest and most satisfactory water heating arrangement made.

The Weir Water Heater

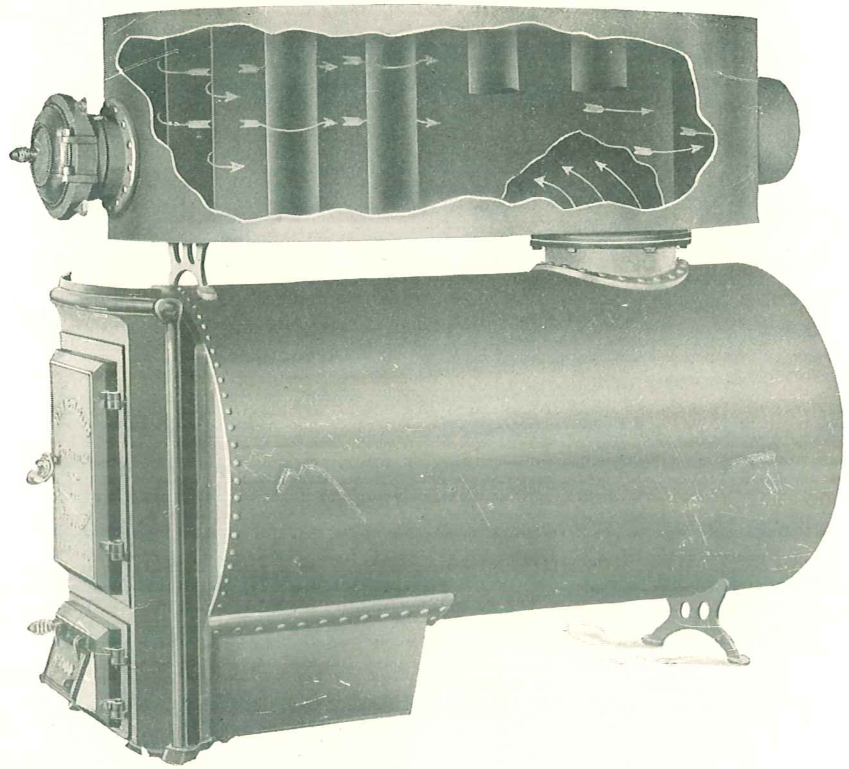
(For Domestic Purposes)

ALL WEIR Furnaces are provided with an opening directly over the feed door where a water heater for range boiler may be connected. All that is necessary is to remove the plate covering the opening and install the water heater, which may be done at the time of installation, or later, without the slightest inconvenience.



This is truly the simplest and most satisfactory water heating arrangement made. The head, or part outside the furnace, is one casting, provided with an opening in the front for cold water intake, and an opening at either side for hot water outlet. The part inside the furnace is a large wrot iron pipe with a smaller inner pipe. The method of installation is clearly illustrated on the opposite page.

The WEIR Water Heater is made in three sizes:
No. 2 for No. 210 and No. 240 WEIR.
No. 3 for No. 280 and No. 300 WEIR.
No. 4 for No. 330 and No. 360, and larger size WEIRS.



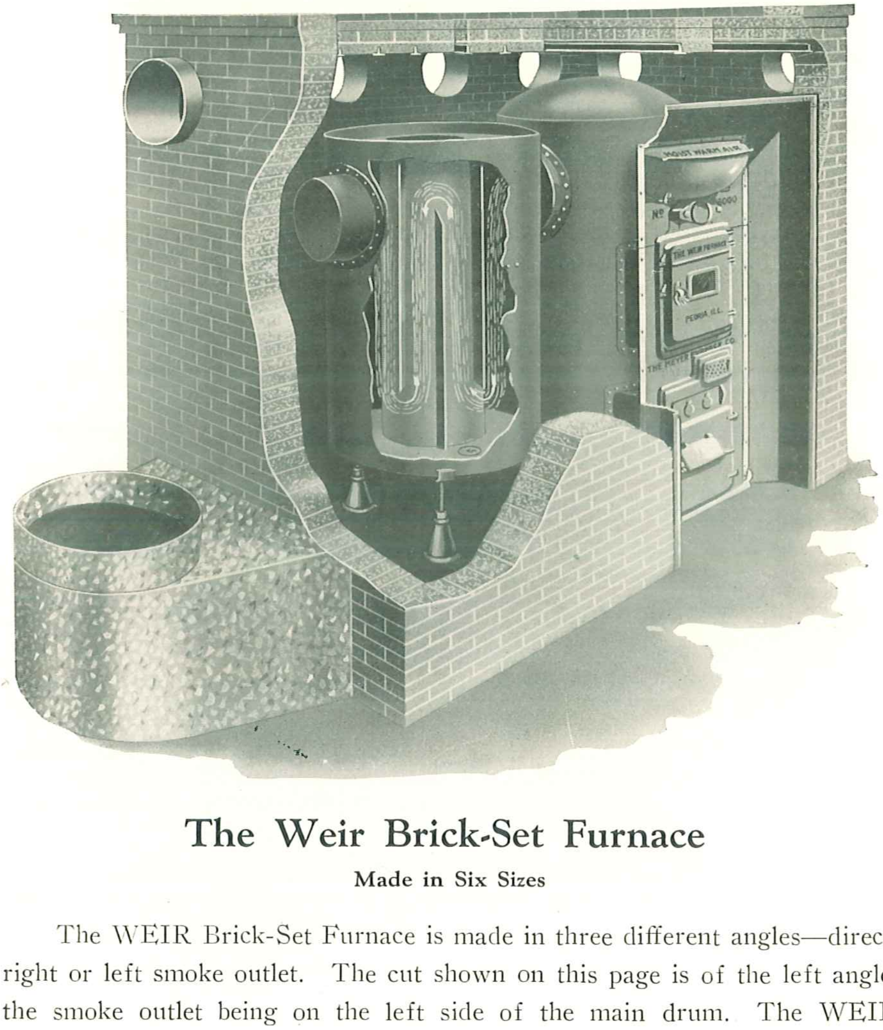
The Weir Wood Furnace

(without casing)

THE WEIR Wood Furnace, being oval, can be easily cased, requiring no piecing or cutting of iron. The firedoor is 12x18 inches in size, with grates of most approved pattern and the length of the fire drum in the smallest size is over four feet.

The Radiator is exceptionally large, has perpendicular flues, and extends several inches over each side of the drum. It can be easily cleaned, as the clean-out door is in the front of the furnace, making it very convenient.

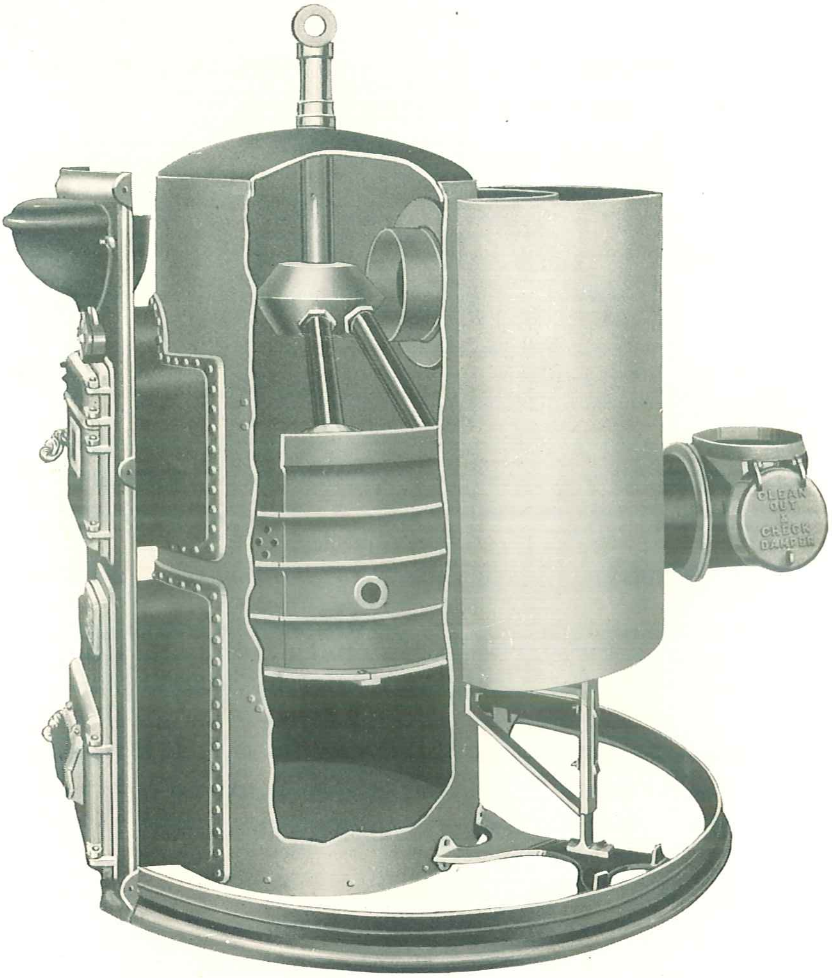
In localities where wood is the principal fuel, this furnace has met with unparalleled success. It is one of the "Weir Family" and worthy of its name.



The Weir Brick-Set Furnace

Made in Six Sizes

The WEIR Brick-Set Furnace is made in three different angles—direct, right or left smoke outlet. The cut shown on this page is of the left angle, the smoke outlet being on the left side of the main drum. The WEIR is the one furnace that can be bricked in successfully. Once put up, brickwork is never disturbed. Especially adapted for large schools, churches and fine residences.



The Weir Combination Furnace

Sectional View Without Casing

Warm Air and Hot Water

It is sometimes the case that a building can be heated with warm air with the exception of one or more distant rooms. With this combination furnace these rooms can be heated with hot water without any extra expense in fuel, and combustion is in no way retarded.

The construction of the attachment is very simple, being hollow castings that take the place of sections of regular firepot lining, and in no way interfere with the gas and soot consuming feature.

Proportions of a Combination Warm Air and Hot Water System

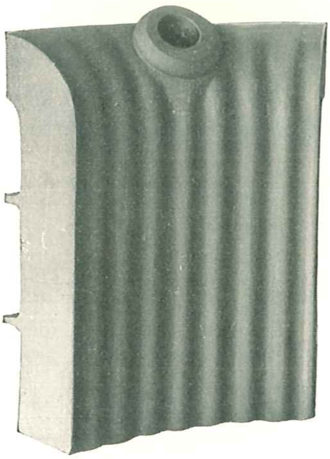
ALL the details set forth for proportioning a warm air system must be used in installing the warm air part of a combination plant.

Size of Furnace

Select a furnace that is amply large to heat the *entire building* with warm air and add the required number of water backs to supply the radiation. Each water back has a capacity of 150 square feet of radiation with covered mains. All exposed pipe area must be counted as radiation. For each water back used, deduct 115 inches from the free pipe area of the heater.

Open Tank

We recommend the Open Tank System of hot water heating on account of its absolute safety. The expansion tank must be located at least three feet above the highest radiator and should be connected to one of the return risers. It must be so arranged that it will be impossible to shut off the tank from the balance of the system. This is very important. This tank should be provided with an overflow pipe and an altitude gauge placed near the furnace in the basement. There should also be a drain pipe placed at the lowest level of the system for the purpose of draining the system when desired. If the building has city water supply, it is a convenience to connect it to the plant.



WEIR Water Back

Amount of Radiation Required

To determine the amount of radiation required, the following formula may be used: ½ glass surface + 1/10 exposed wall surface + 1/60 cubic contents = square feet radiation.

In order to gain the best results, we recommend the following size radiator tappings:

Less than 40	square feet, 1-inch.
40 to 72	square feet, 1¼-inch.
Above 72	square feet, 1½-inch.

Mains and Branches

Care should be taken that mains are equivalent in carrying power to all the branches, but in order to obtain these results it is not necessary that they be equal in area, as there is considerable less resistance in the larger pipes. See table below.

The flow pipe must start from the top of the furnace and pitch upward at least one inch in ten feet and the return pipes must have the same decline towards the lowest points. The flow and return pipe should be run side by side if possible, and be of equal size.

Branches should be taken from the side of mains and be the same size as the risers to the radiators, unless they are exceptionally long.

Quick opening union valves should be used on the flow pipes and union ells on the return at the radiators. Place an air valve on each radiator.

Table of Hot Water Mains and Branches

1-in. pipe will supply two ¾-in. pipes.
1¼-in. pipe will supply two 1-in. pipes.
1½-in. pipe will supply two 1¼-in. pipes.
2-in. pipe will supply two 1½-in. pipes.
2½-in. pipe will supply two 1½-in. and one 1¼-in. or one 2-in. and one 1¼-in. pipes.
3-in. pipe will supply one 2½-in. and one 2-in. or two 2-in. and one 1½-in. pipes.
3½-in. pipe will supply two 2½-in. or one 3-in. and one 2-in. or three 2-in. pipes.

Standard Code

(Revised)

Regulating the Installation

OF

Warm Air Furnaces

In Residences

This Code is approved and issued by authority of the:

National Warm Air Heating & Ventilating Association

National Association Sheet Metal Contractors

Western Warm Air Furnace and Supply Association

Standard Code Regulating the Installation of Warm Air Heating Furnaces in Residences

ARTICLE NO. 1

Meaning of the Term "Warm Air Furnace Heating Plant"

Warm air furnace heating plants, to which this code refers shall consist of one or more warm air furnaces, enclosed within casings, together with necessary appurtenances thereto, consisting of warm air pipes and fittings, cold air or recirculating pipes, boxes and fittings, smoke, pipes and fittings, registers, borders and face plates, the same being intended for heating buildings in which they may be installed.

ARTICLE NO. 2.

Provision to be made in Building under Construction for Reception of Warm Air Furnace Heating Plants

Section 1. (a) The following provisions shall be made by the owner or building contractor, in any building wherein a warm air heating plant is to be installed.

(b) Where warm air register boxes, heads, pipes or stacks are to be installed, joists shall be set not less than sixteen inches (16″) on centers and shall be butted and not lapped. Studding shall be set directly over and under joists, leaving a space of not less than fourteen inches (14″) between studs and joists. Wherever joists are cut, headers must be put in to support joists.

(c) All first story single or sub-floors shall be continuous. In all houses having studded exterior walls these floors shall be extended to the outside sheathing and all spaces between studding shall be closed at the attic line.

Note 1. It is strongly recommended that the attic be tightly floored to reduce heat losses.

(d) All partition walls (or sections of these walls) in which heat stacks to second floor rooms are to be installed, shall be built of six inch (6″) studding to second story floor joists.

Section 2. (a) The owner shall provide a chimney for the furnace constructed in a manner to comply with the following specifications.

(b) The chimney must be absolutely smoke tight throughout its entire length, and must extend at least three feet (3′) above a flat roof or two feet above the ridges of peak roofs.

(c) If built of a single thickness of brick or of cement blocks, it shall be lined throughout its entire length with fire clay flue lining, having not less than three-fourths inch (¾″) thickness. Flue lining to be laid in mortar and made air tight.

(d) The furnace flue must have no other opening for attaching any fireplace, furnace, stove, range, water heater, gas or ventilating connection.

(e) If necessary to offset the flue, it must be done in such a manner as not to reduce the cross sectional area nor create a ledge or obstruction where loose material may lodge.

(f) Its narrowest dimension shall not be less than eight (8″) inches and no flue smaller than 8″ x 8″ rectangular or eight (8″) inch diameter round will be considered suitable when hard coal is to be burned, or 8″ x 12″ rectangular or ten (10″) inch round for soft coal or wood.

Note 2. It is recommended that the height above the furnace grate be not less than twenty-six (26′) feet.

Note 3. It is strongly recommended that all new chimneys be built in strict accordance with the ordinance recommended by the National Board of Fire Underwriters.

ARTICLE NO. 3.

Method for Determining Size of Warm Air Pipes, Wall Stacks and Furnaces for Use in a Residence

Method of Determining Size of Basement Warm Air Pipes.

(Read Explanatory Notes 4 to 11)

Section 1. First Floor Rooms.
Divide square feet of glass by 12,
Divide square feet of net wall by 60,
Divide cubic contents by 800,
Add together the above and multiply by 9.
The result is the area of the basement pipe.

$$\left\{\begin{array}{l} \text{The sum of:} \\ \left.\begin{array}{lcr} \text{Glass (sq. ft.) } \textit{(Note 4)} & \div & 12 \\ \text{Net Wall (sq ft.) } \textit{(Note 5)} & \div & 60 \\ \text{Cubic Contents} & \div & 800 \end{array}\right\} \times 9 = \begin{array}{l}\text{Area of Basement.} \\ \text{Pipe } \textit{(Note 10)}\end{array} \end{array}\right\}$$

Section 2. Second Floor Rooms.
Divide square feet of glass by 12,
Divide square feet of net wall by 60,
Divide cubic contents by 800,
Add together the above and multiply by 6.
The result is the area of the basement pipe.

$$\left\{\begin{array}{l} \text{The sum of:} \\ \left.\begin{array}{lcr} \text{Glass (sq. ft.) } \textit{(Note 4)} & \div & 12 \\ \text{Net Wall (sq ft.) } \textit{(Note 5)} & \div & 60 \\ \text{Cubic Contents} & \div & 800 \end{array}\right\} \times 6 = \begin{array}{l}\text{Area of Basement.} \\ \text{Pipe } \textit{(Note 10)}\end{array} \end{array}\right\}$$

Section 3. Third Floor Rooms.
Divide square feet of glass by 12,
Divide square feet of net wall by 60,
Divide cubic contents by 800,
Add together the above and multiply by 5.
The result is the area of the basement pipe.

$$\left\{\begin{array}{l} \text{The sum of:} \\ \left.\begin{array}{lcr} \text{Glass (sq. ft.) (Note 4)} & \div & 12 \\ \text{Net Wall (sq ft.) (Note 5)} & \div & 60 \\ \text{Cubic Contents} & \div & 800 \end{array}\right\} \times 5 = \text{Area of Basement Pipe (Note 10)} \end{array}\right\}$$

Method of Determining Size of Wall Stacks.

Section 4. First Floor Rooms.
Same as Section 1.

Section 5. Second Floor Rooms.
Deduct 40% from basement pipe area determined in Section 2.

Section 6. Third Floor Rooms.
Deduct 40% from basement pipe area determined in Section 3.

Explanatory Notes

Note 4. In obtaining glass surface use full casement opening. An outside door is figured as glass.

Note 5. To obtain net outside wall multiply height by width and deduct the glass in all windows and outside doors.

Note 6. For rooms having unusual exposure, ordinarily north, northeast and northwest, add 15% to pipe area. For east and west exposure, add 10%.

Note 7. For cold ceilings, add one half net area of ceiling to net exposed wall (cold ceilings are those next to unfloored attics.)

Note 8. Use no warm air pipe less than 8 inches in diameter.

Note 9. It is understood in using the above values for determining basement warm air pipe areas, that these pipes should be run comparatively straight and that they should not be over 10 to 12 feet in length. Sharp turns and long pipes should have extra capacity.

Note 10. These formulae are for 70° inside temperature with zero temperature outside. For a temperature of 10° below zero, add 10% to the capacity of each pipe.

Note 11. The value of 800 (used in cubic contents) is for an estimated air change of one room volume per hour. If it is desired to provide for 1½ room volume use the figure 600. If for 2 room volumes use the figure 400. The factor 8 in Section 1 will give a register temperature of approximately 190° in zero weather. Should a lower register temperature be desired, the factor 9 will give 175° at the register.

Transition Fittings and Stacks

Section 7. Transition from warm air pipes to stacks shall be made with a well designed elbow or boot and no stack shall be less than 60% of the warm air pipe area.

Method of Determining Size of Register

Section 8. All registers shall have a free area at least equal to the calculated area of the basement pipe, transition fitting or stack to which it is connected.

Method of Determining Size of Furnace

Section 9. Add together the actual warm air pipe areas in sq. in. as obtained in Sec. 1, 2 and 3, and select a furnace having a free area not less than the sum of all the warm air pipe areas.

ARTICLE NO. 4.

Installation

Location of Furnace

Section 1. The location of the furnace shall equalize the length of warm air runs as far as possible, yet give necessary preference to pipes supplying living rooms, dining rooms and main halls.

Foundation

Section 2. Furnace foundation of brick, cement, or other incombustible material must be provided. Said foundation to extend at least fifteen (15″) inches at rear and sides of furnace casing and at least thirty-six (36″) inches in front of furnace casing. Foundation to be level.

Setting or Assembling of Furnace

Section 3. (a) The base ring of the furnace shall be cemented to the foundation, making an air tight joint. The furnace parts shall be assembled plumb and level, and in a workmanlike manner.

(b) All sections and joints shall be properly fitted. Joints requiring cement shall be well filled and all bolts shall be drawn up tightly.

Casings

Section 4. (a) Warm air Furnaces shall be enclosed in metal casings or walls of brick, tile or concrete.

(b) Portable. Sheet metal casings including casing tops shall be made of galvanized sheets, not lighter than 26-U. S. Standard Gauge. They shall fit the castings and casing rings closely, so as to be dust tight, and shall be securely fastened to the front. The casing shall be lined from the upper casing ring down to a line on a level with the grate.

(c) When side collars are used the casing top must be of sufficient height so that the largest warm air pipe can be taken from side without ovaling. In no case shall a distance less than eight (8″) inches be maintained between the top of any furnace and the top of casing or bonnet.

(d) Any furnace, the casing top of which shall come within sixteen (16″) inches of a combustible floor, ceiling or joist, shall be protected by a metal shield, extending not less than eighteen (18″) inches beyond the casing of said furnace. This shield shall be suspended at least two inches below wood work, allowing free air space between shield and woodwork. No furnace casing or top, coming nearer than six (6″) inches of ceiling or joists shall be allowed in any case.

(e) Opening for side casing collars shall be cut into the casing top, so that the tops of all openings are on a level. Casing collars shall be fitted into place with a proper flange, or bead on the outside and drawn upon the inside, making a dust-tight joint. All collars shall be of same size as the warm air pipes to which they are to be connected.

(f) Brick set, cement or hollow tile casings shall be constructed as follows: Walls shall be not less than eight (8″) inches in thickness, and shall be constructed air tight. Rectangular casing shall be, with least inside dimensions, the same as that of the portable casing of a corresponding size of furnace. Walls shall be carried to the same height as the portable walls, allowing not less than eight (8″) inches between the top of the furnace and the bottom of the top cover. After placing the collars for the warm air pipes, continue the masonry up even with the top of the collars, lay spacing rods of bar iron on edge or angle irons cross the furnace top, cover these with sheet iron, cover the sheet iron with masonry and run the side walls four (4″) inches above the masonry bed. A galvanized iron casing bonnet may be used on brick set furnaces.

Provision shall be made in the walls for a manhole to give ingress to heater.

Warm Air Pipes in Basement

Section 5. (a) All warm air pipes shall be made of bright tin not lighter than IC, or galvanized iron. Side seams shall be locked seams. All joints shall be either double seamed or lapped not less than one and one-quarter (1¼″) inches and such joints shall be beaded and soldered or riveted. All pipes shall be properly secured to ceiling or joist. No solder or riveted joint is required where round pipe slips over the casing collar. Any pipe twelve (12″) inches or greater in diameter shall not be made of material lighter than IX tin or No. 26 U. S. Standard Gauge galvanized iron.

Note 12. It is recommended that all warm air pipes in the basement shall have an upward pitch of not less than one (1″) inch per running foot.

(b) No warm air pipe shall run within one (1″) inch of any woodwork unless such woodwork is covered with asbestos paper and the paper covered with tin or iron.

(c) All warm air pipes in the basement shall be provided with dampers not more than two feet from casing.

(d) Where warm air pipes pass through a masonry wall, a metal thimble shall be provided, having a diameter at least 1″ greater than the pipe, and pipe supported in such a manner that the air space is uniform on all sides.

Wall Stacks

Section 6. (a) Single Stacks. All single wall stacks or wall pipes, heads, boots, ells, tees, angles and other connections shall be made of bright tin or galvanized iron and shall be covered with not less than one thickness of 12 lbs. per one hundred (100) square feet of asbestos paper. All studding and other woodwork facing said pipe shall be lined with metal and metal lath used in place of wood lath. An air space of not less than three-eights (3/8") of an inch shall be allowed on the two sides nearest the vertical studs. All pipes shall be braced in a proper manner so as not to obstruct the flow of air but to retain the full capacity throughout. All joints shall be locked and held in place by means of lugs, or straps. No joints shall depend wholly upon solder to make it tight.

(b) Double Stacks. All double wall stacks or wall pipes, heads, boots, ells, tees, angles and other connections shall be made of bright tin, not lighter than IC or galvanized iron and shall be made double, from and including the boot or foot piece in basement to the top of each and every stack and register head on all floors. There shall be continuous uniform air space of not less than five-sixteenths (5/16") of an inch, which must be maintained between the outer and inner walls of all such pipes and fittings of all kinds, styles and descriptions; such pipes, heads, boots and other fittings to be of the styles, or equal to those accepted by the National Board of Fire Underwriters.

All pipes and fittings either single or double must be secured firmly in place by lugs or straps attached to the outer walls of stacks and fittings, and no nails shall be driven through these stacks or fittings at any point. No wall pipes or fittings shall be used which depend wholly on soldered joints. The various members shall be so made that all joints are locked and soldered and the several members shall be attached to each other with slip joints, which are, for the purpose intended, air tight.

Registers

Section 7. (a) When baseboard or wall registers are used, they shall be properly and permanently attached to the stack head in such a manner that will prevent any leakage of air between the head and the register.

(b) Floor registers shall be provided either with register borders, or double register boxes of tin or galvanized iron with an air space of not less than five-sixteenths (5/16") of an inch between inner and outer boxes.

(c) Registers for warm air and warm air pipes shall not be located in outside walls. The warm air registers in the various rooms shall be located in or near the inside walls in all cases.

Air Supply of Furnace

Section 8. (a) The air supply to furnace for warm air heating plants may be taken from outside or from within the building or may be taken partially from outside and partially from within. In no case, however, shall air be supplied to any furnace from any basement or furnace room. (b) The cold air intake or return where air is taken from within the building shall have a net area throughout its entire length of not less than the combined net area of all warm air pipes leading from the furnace. This may be maintained in one or more ducts.

(c) When the cold air supply is taken wholly from the outside of the building the supply duct at its most contracted area must equal or exceed eighty (80%) per cent of the combined area of all warm air pipes leading from the furnace.

(d) Cold air ducts shall be constructed of metal, tile or other incombustible material having smooth inner surface and shall maintain a constant net area throughout their entire length and shall be made air tight. Where a boot or shoe is connected to the casing at the base, the opening shall not extend higher than a line on the level of the grate of the furnace. The width of the shoe shall be of proper measurement to make the area at least equal to that of the round or square pipe to which it is connected.

(e) Wherever the space between joists is used to convey cold air over head, the joist and all wooden surfaces between such joists shall be lined with metal and a sheet metal pan constructed to extend not less than six (6″) inches below said joists. The connection from this pan to the boot or shoe shall be made of galvanized iron not lighter than No. 26 U. S. Standard Gauge, and shall have a transition collar, the top area of which shall be at least 10% greater than the area of the connecting pipe.

(d) The cold air face or faces shall be made of wood, or metal. When set in floors the top of same shall be flush with floor. Where cold air face is placed in a seat or side wall (whether furnished by owner, general contractor or furnace contractor) the open work of face must extend to within at least one (1″) inch of the floor line.

The free area of cold air faces shall be at least 10% in excess of the area of the duct or ducts to which they are connected.

Note 13. The effective area of a vertical cold air face lies within twelve (12″) inches of the floor line, hence, the capacity of any vertical cold air face shall be determined by multiplying the base line in inches by not to exceed (12″) inches in height and deducting for the grills or cross bars.

Smoke Pipes

Section 9. (a) The smoke pipe shall be as short and direct as consistent with the location of the furnace. It shall be made of either black or galvanized iron not lighter than No. 24 U. S. Standard gauge, and of the full size of the collar on the furnace throughout its entire length. It must have no other opening for attaching any fire place, stove, range, water heater, gas or ventilating connection. It shall be lock seamed or riveted; all joints shall lap not less than one and one-half (1½″) inches and it shall be rigidly secured. Cast iron smoke pipe may be used.

(b) Where the smoke enters the flue, a thimble shall be cemented into the flue and the connections thereto made air tight. Should any smoke pipe come within sixteen (16″) inches of any combustible material, such combustible material must be covered with asbestos paper and a metal shield so fastened that a two inch air space exists between this shield and the combustible material. The shield shall be no less in size than twice the diameter of the smoke pipe and of sufficient length to cover the wood at all points.

(c) No smoke pipe shall project through any external wall or window.

Pipeless or One Pipe Furnace

Section 10. (a) When but one duplex grating is used for both warm air and cold air in a so-called pipeless furnace, the area of the cold air intake shall be at least equal to the area of the warm air outlet of the grating. Art. 4, Sec. 4, relative to casing shall not govern when this type of furnace is installed, but the following specifications shall be followed: The inner and outer casing of this type of furnace may be made of either black or galvanized iron not lighter than No. 26 U. S. Standard Gauge. A uniform air space shall be maintained at all points between the inner and outer casing. In no case shall the top of the furnace be allowed closer than twelve (12″) inches to any ceiling or joists above the furnace. (b) Where joists are cut to accomodate this furnace, headers shall be put and braced so as not to weaken the structure of the floor above the furnace.

(c) Article No. 3 for determining area of warm air pipe shall not govern in figuring a pipeless furnace.

(d) Where one warm air register face is used and separate face or faces for cold air supply are used, then Article No. 4, Sections 5 and 8 shall apply.

(The foregoing is the Standard Code regulating the installation of warm air furnaces in residences.)

Humidity

During the heating season the air in a building is apt to be too dry no matter what system of heating is used. The dryness of indoor air varies with the difference between the outside and the inside temperature. In ordinary buildings the air can only be properly moistened where warm air furnaces are installed. Water may be evaporated in the warm air chamber of the furnace and the moisture conducted to all parts of the building by the air that is used for warming. All warm air furnaces have water pans, most of them not being correctly located. A series of experiments and much careful study has convinced us that a large water pan should be located near the top of the furnace, over the feed door as we have located it on the WEIR.

It is a well established fact, that with the proper amount of moisture in the air, occupants of buildings will feel warmer and more comfortable in a temperature of 68 degrees than in a temperature of 72 degrees where the moisture or relative humidity is low.

Dimensions and Heating Capacities

Weir Portable Furnaces

No.	Main Drum Height Inches	Main Drum Diameter Inches	Height of Radiator Inches	Diam. of Casing Inches	Diam. Smoke Pipe Inches	Grate Surf'ce Sq. Ft.	Pipe Area Rating Sq. In.	B.T.U. Capacity per Hour
210	50	21	30	48	9	1.6	374	51609
240	54	24	33	52	10	2.1	491	67737
280	58	27	36	54	10	2.7	631	97091
300	60	30	40	58	10	3.7	865	119347
330	60	33	40	65	10	4.6	1076	148377
360	62	36	40	67	10	5.5	1287	177408

Weir Brick-Set Furnaces

No.	Main Drum Height Inches	Main Drum Diameter Inches	Height of Radiator Inches	*Diameter of Brick Work Feet Inches	Diam. Smoke Pipe Inches	Grate Surf'ce Sq. Ft.	Pipe Area Rating Sq. In.	B.T.U. Capacity per Hour
2800	58	27	36	4'9" x 7'3"	10	2.7	631	97091
3000	60	30	40	5'0" x 7'10"	10	3.7	865	119347
3300	60	33	40	5'7" x 8'8"	10	4.6	1076	148377
3600	62	36	40	5'10" x 9'2"	10	5.5	1287	177408
540	66	40	44	6'6" x 9'11"	12	6.7	1568	216115
544	66	44	48	6'10" x 10'7"	12	8.3	1942	267724

*Dimensions of masonry are only approximate. Manhole door furnished with brick-set furnaces. Extension and front as shown on page 23 sizes 2800 to 3600 only.

Weir Circulating Room Heaters

No.	Main Drum Height Inches	Main Drum Diameter Inches	Height of Radiator Inches	Diameter of Casing Inches	Diam. Smoke Pipe Inches	Grate Surf'ce Sq. Ft.	Pipe Area Rating Sq. In.	B.T.U. Capacity per Hour
210	50	21	30	48	9	1.6	* 374	* 51609
240	54	24	33	52	10	2.1	491	67737
280	58	27	36	54	10	2.7	631	97091
300	60	30	40	58	10	3.7	865	119347
330	60	33	40	65	10	4.6	1076	148377
360	62	36	40	67	10	5.5	1287	177408

*Ratings of furnaces installed as room heaters, without pipes, may be increased 30%, since there is no heat loss between casing bonnet and register.

Weir Wood Furnaces

No.	Diam. of Fire Drum Inches	Length of Fire Drum Inches	Size of Radiator Inches	Height of Radiator Inches	Total Height Inches	Diam. of Smoke Pipe Inches	Max. Area W. A. Pipes Sq. In.
024	24	52	28x52	18	52	10	720
030	30	58	34x58	18	58	10	1200

Basis for Rating Weir Furnaces

Coal Value	12800 B. T. U. per lb.
Register Temperature	175 Deg. F.
*W. A. Pipe, capacity per sq. in., First Floor	103 B. T. U.*
*W. A. Pipe, capacity per sq. in., Second Floor	172 B. T. U.*
Combustion Rate per sq. ft. Grate Surface	6 Pounds
Efficiency of Furnace at Bonnet	60%
Heat loss between Bonnet and Register	30%

B. T. U. capacity at Bonnet per sq. ft. grate surface: 12800 x 6 x 60=46080 B. T. U. (per hour).

B. T. U. capacity at register per sq. ft. grate surface: 46080 x .70=32256 B. T. U. (per hour).

*Average B. T. U. capacity per sq. in. pipe area on first and second floor at 175° register temperature: (103+172)÷2=138 B. T. U.

Sq. in. pipe area capacity of furnace per sq. ft. grate: 32256÷138=234. (Approx.)

Pipe area capacity of furnace at register in sq. in.: 234 x Grate surface in sq. ft.

B. T. U. capacity of furnace at register: 32256 x Grate surface in sq. ft.

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*NOTE: *The factors 103 and 172 are taken from University of Illinois tests Bulletin No. 141.*

Sizes of Casings

The sizes given below are exact; no allowance is made for laps. Height of Hood, should be as high as conditions will allow, but MUST NEVER BE LESS THAN 12 INCHES FROM TOP OF MAIN DRUM.

Weir Portable Furnaces

No.	Hood.	Lower Section	Upper Section
210	12 ft. 7⅜ in. in circ.	10 ft. 9 in. x 30 in.	10 ft. 9 in. x 16 in.
240	13 ft. 8 in. in circ.	11 ft. 6 in. x 29½ in.	11 ft. 6 in. x 19⅞ in.
280	14 ft. 3 in. in circ.	12 ft. 2 in. x 29½ in.	12 ft. 2 in. x 19⅞ in.
300	15 ft. 2 in. in circ.	13 ft. 2 in. x 29½ in.	13 ft. 2 in. x 19⅞ in.
330	17 ft. ½ in. in circ.	15 ft. 1 in. x 29½ in.	15 ft. 1 in. x 19⅞ in.
360	17 ft. 8½ in. in circ.	15 ft. 6 in. x 29½ in.	15 ft. 6 in. x 19⅞ in.

Weir Wood Furnaces

No.	Bottom Section	Center Section	Hood
024	13 ft. ¾ in. x 2 ft. 4 in.	14 ft. 11½ in. x 2 ft.	14 ft. 11½ in. x 18 in
030	15 ft. 4¼ in. x 2 ft. 4 in.	17 ft. 3½ in. x 2 ft. 4 in.	17 ft. 3½ in. x 18 in.

Guarantee

CAPACITIES given of WEIR Heaters are based on actual tests made in this climate providing for twenty degrees below zero. We guarantee them correct providing the proportions of the system are determined by the foregoing rules and that the furnace is properly installed and connected to the chimney having a sufficient draft and that it be operated in accordance with our printed directions.

Engineering Department

This company maintains an up-to-date Engineering Department for preparing full detailed plans and estimates and where other information may be secured. In order to secure plans and estimates, submit complete architect's plans if possible. If not, submit sketch of the basement and all floors, giving size and location of all windows and doors, height of all ceilings, size and location of all windows and doors, size and location of all chimneys, piers, girders, etc. If it is a theatre or church, state whether the floor is level or sloping. It is absolutely necessary to have complete information in order to get out accurate plans.

If we prepare a plan and the system is installed as we show it, and operated in accordance with our printed directions, we will guarantee the system in every way. There is no charge for the service rendered by this department.

Capacity of Pipes and Registers

Size of Pipe, Inches	Area Square Inches	Size of Register Inches	Size of Pipe Inches	Area Square Inches	Size of Register Inches
8	50	8x12	22	380	24x24
9	63	9x12	24	452	27x27
10	78	10x12	26	531	30x30
12	113	12x14	28	616	28x36
14	154	14x18	30	707	30x36
16	201	16x20	32	804	36x36
18	254	18x24	34	908	36x40
20	314	20x24	36	1018	36x48

Circumference and Area of Circles

Diam. Inches	Circumference	Area	Diam. Inches	Circumference	Area	Diam. Inches	Circumference	Area
1	3.141	.7854	9½	29.84	70.882	24	75.39	452.39
1¼	3.927	1.227	9¾	30.63	74.662	24½	76.96	471.43
1½	4.712	1.767	10	31.41	78.539	25	78.54	490.87
1¾	5.497	2.405	10¼	32.20	82.516	25½	80.10	510.70
2	6.283	3.141	10½	32.98	86.590	26	81.68	530.93
2¼	7.068	3.976	10¾	33.77	90.762	26½	83.25	551.54
2½	7.854	4.908	11	34.55	95.033	27	84.82	572.55
2¾	8.639	5.939	11¼	35.34	99.402	27½	86.39	593.95
3	9.424	7.068	11½	36.12	103.86	28	87.96	615.75
3¼	10.21	8.295	11¾	36.91	108.43	28½	89.53	637.94
3½	10.99	9.621	12	37.69	113.09	29	91.10	660.52
3¾	11.78	11.044	12½	39.27	122.71	29½	92.97	683.49
4	12.56	12.566	13	40.84	132.73	30	94.24	706.86
4¼	13.35	14.186	13½	42.41	143.13	30½	95.81	730.61
4½	14.13	15.904	14	43.98	153.93	31	97.38	754.76
4¾	14.92	17.720	14½	45.55	165.13	31½	98.96	779.31
5	15.70	19.635	15	47.12	176.71	32	100.5	804.24
5¼	16.49	21.647	15½	48.69	188.69	32½	102.1	829.57
5½	17.27	23.758	16	50.26	201.06	33	103.6	855.30
5¾	18.06	25.967	16½	51.83	213.82	33½	105.2	881.41
6	18.84	28.274	17	53.40	226.98	34	106.8	907.92
6¼	19.60	30.679	17½	54.97	240.52	34½	108.3	934.82
6½	20.42	33.183	18	56.54	254.46	35	109.9	962.11
6¾	21.20	35.784	18½	58.11	268.80	35½	111.5	989.80
7	21.99	38.484	19	59.69	283.52	36	113.0	1017.8
7¼	22.71	41.282	19½	61.26	298.64	36½	114.6	1049.3
7½	23.56	44.178	20	62.83	314.16	37	116.2	1075.2
7¾	24.34	47.173	20½	64.40	330.06	37½	117.8	1104.4
8	25.13	50.265	21	65.97	346.36	38	119.3	1134.1
8¼	25.91	53.456	21½	67.54	363.05	38½	120.9	1164.1
8½	26.70	56.745	22	69.11	380.13	39	122.5	1194.5
8¾	27.48	60.132	22½	70.68	397.60	39½	124.0	1225.4
9	28.27	63.617	23	72.25	415.47	40	125.6	1256.6
9¼	29.05	67.200	23½	73.82	433.73			

Areas of Wood Cold Air Faces

SIZE	Area of Air Space in Square Inches	Nearest Size of Round Pipe of Equivalent Area	SIZE	Area of Air Space in Square Inches	Nearest Size of Round Pipe of Equivalent Area
12 x 20	135	12-in.	24 x 26	349	20-in.
12 x 24	161	14-in.	24 x 30	403	22-in.
12 x 30	202	16-in.	28 x 28	439	22-in.
14 x 20	157	14-in.	30 x 30	504	26-in.
14 x 24	188	14-in.	36 x 20	403	22-in.
14 x 30	235	16-in.	36 x 24	484	24-in.
16 x 20	179	14-in.	36 x 30	605	28-in.
16 x 24	215	16-in.	36 x 36	725	30-in.
16 x 30	269	18-in.	72 x 12	486	
18 x 24	242	18-in.	72 x 14	566	
18 x 30	303	20-in.	72 x 16	646	
20 x 20	224	16-in.	72 x 18	726	
20 x 24	269	18-in.	72 x 20	806	
20 x 26	291	18-in.	72 x 24	968	
20 x 30	336	20-in.	72 x 30	1210	
24 x 24	323	20-in.	72 x 36	1450	

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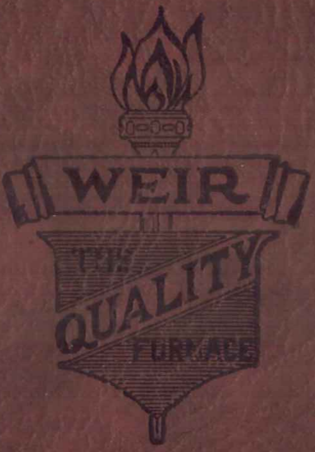

"It Does Save Coal"